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An Original Method of Using Dry Heat of High Temperature in the Treatment of Chronic Joint Affections

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LAST October I presented to the Mississippi Valley Medical Association an informal report of the use of dry heat of high temperature in the treatment of chronic joint affections. I had at that time been using this method of treatment for about one year. Notice of this informal report was given in several of the medical journals throughout the United States. As a result of this informal report I received during the past year a number of letters asking me to direct the writers to a full report of my method of using the heat. These letters I answered in person, but as no full report had been made it required in each case that a complete description be made of my apparatus. That my article had attracted some little attention seemed to me reason enough for my presenting at this time a full description of the apparatus I am using.

Medical writings indicate that heat and cold have been used for many ages to allay all forms of inflammation. The effect of these agents is determined firstly by their influence in modifying the circulation of the blood, secondly by their power to increase the activity of the lymphatic circulation, thirdly by their modification of the secretion, and fourthly in certain instances by the apparent influence on the nerve-supply to a part.

In the effort to allay inflammation by heat this agent has been used of nearly every range of the thermometer, from that of the blood to that of the white heat of the Paquelin cautery. The low temperatures are applied for prolonged periods, ofttime while the higher temperatures are used only momentarily.

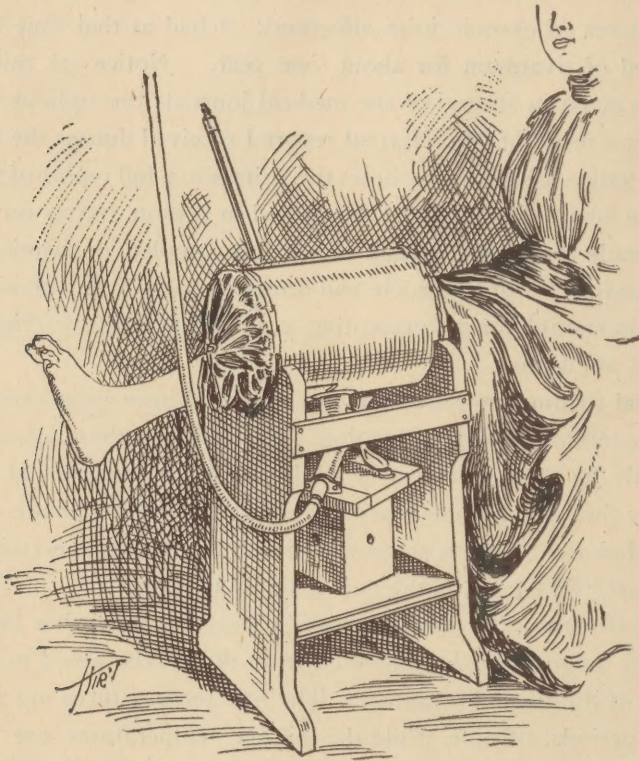
The method I am describing contemplates the *prolonged use* of a high temperature, say 250 to 300 degrees F. for a period of one-half to one and one-half hours. While the prolonged use of low temperatures and the momentary use of high temperatures each modify the circulation, and the lat-

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presented by the author —

ter probably the nerve-supply, they neither of them markedly influence the secretions, and but little, if any, do they increase the lymphatic circulation.

On the other hand, the prolonged use of high temperatures, while in a like manner it influences the blood and nerve-supply, it in addition enormously increases the secretions; and further, it is my belief (though I am not able to demonstrate it) that the lymphatic circulation is enormously increased, thereby rapidly taking up in its circulation the deposits which have taken place in the diseased joint, which in a measure accounts for the greater freedom of motion noticeable in these joints after the prolonged use of high temperature.



Apparatus for using dry heat of high temperature in the treatment of chronic joint affections.
(The foot should have been on a chair of the proper height.)

Physics and physiology teach us that while the body can only bear a temperature of about 160 degrees in a saturated atmosphere, yet if the air is kept very dry the body can stand a temperature of several hundred degrees F. for part or even a whole hour. To give exact data it is stated that a man

has endured for half an hour a temperature of over 600 degrees F. in a drying oven.

The apparatus before you, which, by the way, I have had made for a Boston surgeon, consists of a copper cylinder $12\frac{1}{2}$ inches long and 10 inches in diameter. Fitting into each end of the cylinder is a wooden ring or disc one inch wide by one inch thick. The wooden rings are secured in the ends of the cylinder by eight short screws passing from the outside through the cylinder into the rings. At each end of the cylinder is a hood which encircles the limb, and is drawn tight by means of puckering strings. The hood is made of double coated rubber cloth, and is attached to the cylinder by being nailed to the wooden rings, the extreme end of the hood being held in place by a wire band. On each side of the cylinder diametrically opposed are two or three holes $\frac{1}{2}$ inch in diameter. The purpose of these holes is to allow a rapid change of air in the cylinder. In using these cylinders I have seen the air come out of these holes with such force as to put out a lighted match. The cylinder is supported horizontally in a wooden frame so that the lower surface of the cylinder is 18 inches from the floor, or about the height of an average chair.

I have applied heat by means of oil, gasoline, or alcohol lamp, the gas jet, and the mixed gas and air jet, which is the Bunsen flame; the latter is probably the most convenient. The heat should not be turned on too rapidly at first, as the patient's endurance is greater if the heat is applied gradually.

In using this method for the knee I apply a layer of cotton to the back of the limb in the popliteal region, securing it in place by loosely-tied tapes. This is done for two reasons: in the first place it will equalize the temperature, as undoubtedly the lower part of the cylinder is much hotter than the upper, and secondly I found that the profuse perspiration, resulting from the high temperature, caused a dropping of fluid to the bottom of the cylinder, where it was instantly turned into steam, and this steam would immediately scald the limb.

The limb, being thus protected by the cotton, is inserted into the cylinder until the knee is in the center, the heel placed on a chair high enough to keep the calf from touching, if possible, even the wooden rings, which though they do not ordinarily burn, yet they may get uncomfortably warm. The hoods are drawn tightly around the limb, and at the start rubber corks are inserted in the holes in the cylinder, but are withdrawn when the cylinder is thoroughly

heated. The heat is then applied to the cylinder and is carried up to the limit of endurance of the patient, which varies from 250 to 300 degrees, and is kept at this point for an hour or more. One patient of mine could stand a temperature of 290 degrees for over an hour. In a case I recently treated I carried the temperature to the extreme point of 360 degrees F. for a period of nearly five minutes.

The thermometer I use is a laboratory thermometer with a scale that will register up to 450 degrees F. I have found it most satisfactory to allow the patient to hold one end of the thermometer, while the bulb end is held within the cylinder along side the knee against the cotton. Care should be taken not to touch the limb with the thermometer, for if this happens the limb will be blistered; this can easily be prevented by the proper use of the cotton.

The number and size of the holes in this cylinder is not sufficient to give perfect ventilation, so that after twenty or more minutes the air in the cylinder becomes so moist from the profuse perspiration that I find it advantageous to loosen the hoods for about a minutes at a time to allow a free exchange of air. This lowers the temperature 20 or 30 degrees, but the cylinder is so hot that it quickly returns to its former range.

The effect of such high temperature is to enormously increase the perspiration from the local part, to increase perspiration over at least the surface circulation, to increase the lymphatic circulation, to relieve pain, and to increase motility in the joint. The relief of pain and the increased motility last for some hours after the application of the heat.

To make it a little plainer what these effects are I will go somewhat into detail. In regard to the perspiration of the local part I would say that it is so great that if not absorbed by the under layer of cotton it will roll off rapidly in drops, and the whole amount evaporated in an hour must be considerable. The circulation of the blood is also greatly increased, and is very apparent on the surface, the part being reddened and the arterioles dilated as is seen in the blush of an erysipelas. The pain and stiffness are greatly relieved. Take, for instance, an old case of gonorrheal rheumatism, or rheumatoid arthritis, and we will find that at all times there is more or less pain with considerable stiffness, and the motions of the joint are accompanied with creaking sounds. At times there are exacerbations when all these symptoms are considerably increased. It has been my experience in the use of this apparatus that very soon after the temperature in the cylinder is raised to 250 degrees the patient

feels entirely relieved of the pain, and on removing the limb from the apparatus after the treatment it is found that the motility of the joint is considerably increased, and the creaking sounds have greatly diminished, or entirely disappeared. The marked effect of the heat is especially noticeable at the time of an exacerbation, when the difference in the condition of the joint before and after the treatment is considerable.

To give you an idea of how hot the inside of the cylinder becomes I would state that the cotton covering the popliteal space becomes burnt to a brown, and the index of the thermometer, which is of paper and inside the glass tube, also becomes singed to a brown color. I have used the apparatus in cases of simple rheumatism, rheumatoid arthritis, gonorrheal rheumatism, and simple synovitis. I have not as yet used this method in cases of tubercular joint-disease, fearing that the resolution which might be brought about might cause a general tuberculosis, instead of the local disease.

At a meeting of the American Orthopedic Association recently held at Buffalo, where I read a paper on this subject, Dr. A. J. Gillette, of St. Paul, Minn., for whom I furnished some time ago an apparatus similar to the one before you, reported that he had used it in a number of cases with excellent results so far, but that he had not used the apparatus long enough to make a final report. Recently, through the courtesy of Dr. R. M. Woodward, I had the opportunity of using this method on what I consider very nearly a test case. Many of you will remember that at a meeting of the Cleveland Medical Society a month or two ago, Dr. Woodward reported an old case of gonorrheal rheumatism of some years' standing in a man about forty years of age. The doctor stated that many physicians had given advice in the case as to treatment, but up to that time very little benefit had been derived from the suggestions made; he asked for further advice as to treatment. At that time I suggested that my apparatus be tried, which suggestion has since been followed out. On June 16, in the presence of the house staff of the Marine Hospital, I kept the above patient's left knee in this apparatus for forty minutes. The temperature ranged for the most of the time from 310 to 340 degrees F., reaching at one time the extreme range of 360 degrees F., and remaining there for nearly five minutes. After the treatment the patient said that all the pain had left the joint; the motion of the joint was freer, and all creaking had disappeared. The house doctor tells me that since then they have been continuing the use of the apparatus in his case; that on Saturday night prior to last Sunday's storm the patient complained

of his knee feeling much worse, stating his belief that a storm was coming, and requesting that the apparatus be used. This was done, and after the treatment the patient stated that the pain was all gone and "that he felt all right." The doctor tells me that the patient is receiving much benefit from the apparatus and is desirous of leaving the hospital.

We all realize how difficult it is to give relief in such conditions as rheumatoid arthritis and gonorrheal rheumatism. Yet I have had patients suffering from these conditions claim that the pain was relieved as soon as considerable heat was attained, and that the motility and the pain were both benefited for some hours. Anything that will give relief to these patients will be hailed with delight by the profession at large, and especially by those suffering from these complaints.

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